

MOTOR DRIVING SYSTEM

FIELD OF THE INVENTION

5 The present invention relates to a motor driving system,
and more particularly to a motor driving system that
allows setting of a motor speed when an input supply
voltage is low.

10 BACKGROUND OF THE INVENTION

According to the characteristics of driving elements
of the currently available fan motors, when an input
supply voltage thereof is high, the fan is driven to
15 rotate at full speed to increase a cooling efficiency
thereof, and when the input supply voltage thereof is
low, the fan is driven to rotate at a lowest possible
speed. That is, the fan speed is adjusted according
to a linear change in the high and low level of the
20 input supply voltage. In this manner, the lowest
rotating speed of the fan at the low input supply voltage
is a fixed value that could not be varied. Therefore,
the fan has limited applications and could not always
meet consumers' needs.

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It is therefore tried by the inventor to develop an

improved motor driving system to eliminate drawbacks
existed in the conventional fan motors.

SUMMARY OF THE INVENTION

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A primary object of the present invention is to provide
a motor driving system that utilizes a
voltage-stabilizing unit to produce a constant voltage,
and a signal-generating unit to produce an input signal
10 that varies with a level of an input supply voltage
supplied from a power supply unit. A comparing unit
compares the constant voltage with the input signal.
When the input supply voltage is low, the input signal
changes and is compared with the constant voltage by
15 the comparing unit, so that a lowest rotating speed
is set for the motor.

BRIEF DESCRIPTION OF THE DRAWINGS

20 The structure and the technical means adopted by the
present invention to achieve the above and other objects
can be best understood by referring to the following
detailed description of the preferred embodiments and
the accompanying drawings, wherein

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Fig. 1 is a block diagram of a motor driving system

according to a first preferred embodiment of the present invention;

Fig. 2 is a circuit diagram of the motor driving system
5 according to the first preferred embodiment of the present invention;

Fig. 3 is a block diagram of a motor driving system
according to a second preferred embodiment of the
10 present invention; and

Fig. 4 is a circuit diagram of the motor driving system
according to the second preferred embodiment of the
present invention.

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DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please refer to Fig. 1 that is a block diagram of a motor driving system according to a first preferred
20 embodiment of the present invention. As shown, the motor driving system of the present invention mainly includes a power supply unit 11, a voltage-stabilizing unit 12, and a driving element 10. The power supply unit 11 provides an input supply voltage to the
25 voltage-stabilizing unit 12 and the driving element 10. The voltage-stabilizing unit 12 produces a

constant voltage and provides the same to the driving element 10. The driving element 10 includes a signal-generating unit 101, a comparing unit 102, and a control unit 103. The signal-generating unit 101 is adapted to generate an input signal, which varies with high and low levels of the input supply voltage from the power supply unit 11. The comparing unit 102 is adapted to compare the constant voltage produced by the voltage-stabilizing unit 12 with the input signal generated by the signal-generating unit 101, and to generate a comparison signal. The control unit 103 is adapted to control a motor speed according to the comparison signal generated by the comparing unit 102.

Fig. 2 is a circuit diagram of the motor driving system of Fig. 1. Please refer to Figs. 1 and 2 at the same time. The power supply unit 11 is electrically connected via a first capacitor C1 to a power input pin Vcc of the driving element 10. The voltage-stabilizing unit 12 is a voltage-stabilizing circuit including a first resistance 121, a second resistance 122, a third resistance 123, and a voltage-stabilizing element 124, which may be a Zener diode. The voltage-stabilizing unit 12 is electrically connected to the power supply unit 11 and to a VTH pin of the driving element 10. A Hall element

13 is electrically connected to pins HB, IN-, and IN+ of the driving element 10. A Hall bias voltage is produced at the pin HB and supplied to the Hall element 13, so that the Hall element 13 is actuated to produce
5 a Hall induced voltage for outputting to pins IN- and IN+. A second capacitor C2 is electrically connected to a pin CPWN of the driving element 10 for setting a frequency level for the input signal generated by the signal-generating unit 101. A motor M1 is
10 electrically connected to first and second outputs OUT1, OUT2 of the driving element 10.

When an input supply voltage is supplied from the power supply unit 11 to the voltage-stabilizing unit 12, the
15 driving element 10, and the signal-generating unit 101, the comparing unit 102, and the control unit 103 inside the driving element 10, the input supply voltage is reduced at the first resistance 121 of the voltage-stabilizing unit 12, stabilized at the
20 voltage-stabilizing element 124, and divided at the second resistance 122 and the third resistance 123 to produce a constant voltage, which is input to the pin VTH of the driving element 10. When the input supply voltage is high, the motor M1 is rotated at full speed;
25 and, when the input supply voltage is low, the input signal generated by the signal-generating unit 101

changes. The comparing unit 102 compares the constant voltage at the pin VTH with the changed input signal to generate a comparison signal, which is output to the control unit 103, so that a control signal is output
5 from the first and the second output OUT1, OUT2 to control the motor M1 to rotate at the lowest speed.

The voltage-stabilizing element 124 may be otherwise a voltage stabilizer (not shown), and the
10 signal-generating unit 101 may be otherwise a resistor-capacitor (RC) circuit or an oscillator (not shown) to provide the same function.

Fig. 3 is a block diagram of a motor driving system
15 according to a second preferred embodiment of the present invention. As shown, the second preferred embodiment of the motor driving system of the present invention mainly includes a power supply unit 21 and a driving element 20. The power supply unit 21 provides
20 an input supply voltage to the driving element 20. The driving element 20 includes a voltage-stabilizing unit 204, a signal-generating unit 201, a comparing unit 202, and a control unit 203. The voltage-stabilizing unit 204 includes a voltage-stabilizing element 2043
25 (see Fig. 4) for stabilizing a voltage. The signal-generating unit 201 is adapted to generate an

input signal, which varies with high and low levels of the input supply voltage from the power supply unit 21. The comparing unit 202 is adapted to compare a constant voltage produced by the voltage-stabilizing unit 204 with the input signal generated by the signal-generating unit 201, and to generate a comparison signal. The control unit 203 is adapted to control a motor speed according to the comparison signal generated by the comparing unit 202.

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Fig. 4 is a circuit diagram of the motor driving system of Fig. 3. Please refer to Figs. 3 and 4 at the same time. The power supply unit 21 is electrically connected via a first capacitor C21 to a power input pin Vcc of the driving element 20. The voltage-stabilizing element 2043 may be a Zener diode and is connected via a pin 6VREG to a first resistance 2041 and a second resistance 2042, and is then shunted to a pin VTH of the driving element 20. A Hall element 23 is electrically connected to pins HB, IN-, and IN+ of the driving element 20. A Hall bias voltage is produced at the pin HB and supplied to the Hall element 23, so that the Hall element 23 is actuated to produce a Hall induced voltage for outputting to pins IN- and IN+. A second capacitor C22 is electrically connected to a pin CPWN of the driving element 20 for setting

a frequency level for the input signal generated by the signal-generating unit 201. A motor M2 is electrically connected to first and second outputs OUT1, OUT2 of the driving element 20.

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When an input supply voltage is supplied from the power supply unit 21 to the driving element 20 and the voltage-stabilizing unit 204, the signal-generating unit 201, the comparing unit 202, and the control unit 203 inside the driving element 20, the input supply voltage is stabilized at the voltage-stabilizing element 2043 of the voltage-stabilizing unit 204 and output at the pin 6VREG, and then divided at the first resistance 2041 and the second resistance 2042 to produce a constant voltage, which is output to the pin VTH of the driving element 20. When the input supply voltage is high, the motor M2 is rotated at full speed; and, when the input supply voltage is low, the input signal generated by the signal-generating unit 201 changes. The comparing unit 202 compares the constant voltage at the pin VTH with the changed input signal to generate a comparison signal, which is output to the control unit 203, so that a control signal is output from the first and the second output OUT1, OUT2 to control the motor M2 to rotate at the lowest speed.

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The voltage-stabilizing element 2043 may be otherwise
a voltage stabilizer (not shown), and the
signal-generating unit 201 may be otherwise a
resistor-capacitor (RC) circuit or an oscillator (not
5 shown) to provide the same function.

With the motor driving system of the present invention,
the motor M1, M2 may be set to the lowest rotating speed
when the input supply voltage is low. Therefore, the
10 present invention allows the motor to have widened
applications.

The present invention has been described with some
preferred embodiments thereof and it is understood that
15 many changes and modifications in the described
embodiments can be carried out without departing from
the scope and the spirit of the invention that is intended
to be limited only by the appended claims.